Properties of Common Objects
Teacher Background (SC000300)

Scientists identify materials by their properties. Such characteristics as color, density, texture, odor, sound, and malleability (ability to change shape) are important to the understanding of the laws of chemistry. Properties are associated with elements and compounds.

Biologists traditionally speak of five senses: sight, hearing, smell, touch, and taste. New research has indicated that there may be other senses and that much of our perception is a result of subtle combinations of senses. Each sense has a special set of nerve receptors, which link to our brain through peripheral nerves. There are at least four different receptors for taste (salty, sweet, sour, bitter), four for touch (pain, pressure, hot, and cold), and two distinct kinds of sight receptors (rods for black and white; cones for color vision) in our eyes. The receptors for hearing are deep within the semicircular canals of the ear. The sense of smell is our most complex (and probably most primitive) sense. It is poorly understood by scientists, and tightly connected to a number of subconscious processes. Nothing provokes an old memory like a smell!

Some of the properties of materials can change while the substance remains the same. These are called physical changes. For example, breaking a cookie or melting a popsicle changes the physical properties but they are still the same substances. Changes of state—from solid to liquid or liquid to gas—are called physical changes. They can result from change in temperature or change in pressure. (An ice skate melts the ice under it even thought the pressure is the same.) And change in temperature does not *always* result in a change in state. (You can heat water for a while before it begins to boil.) But in the experience of young children, there will be a close association between temperature and state changes that is largely accurate.

Chemical changes result in new substances. For example, to make the cookie we started with egg protein, sugar, and starch from wheat, but the new substance has different chemicals joined together. This unit does not deal extensively with chemical changes.

The making of butter (Lesson 10) begins with a physical change, the separation of the water-soluble milk protein from the oil-soluble cream in what we buy as “cream.” (It is really the mostly-cream component of cow’s milk.) When the oily cream is nearly pure, the molecules form new bonds and a different fat, which we call butter. (Modern butter substitutes are mixtures of many different kinds of oils, such as safflower, canola, soy or cocoanut oils. Each has its own melting point, and mixtures have characteristic melting points and consistencies.) While students will not know a lot about what’s in milk, they can see a process a little like cream separation if they buy natural peanut butter. The peanut oil separates on the top.

Teaching Methods

The SCoPE kindergarten units all focus on the science processes of observation and classification. Other processes (such as prediction and data collection) are practiced but not assessed. Observation teaches young children that the world is predictable and can be studied with the senses. The National Science Teachers' Association reminds teachers that "Science is based upon the idea that there is order in the universe and that therefore the universe is predictable." (*Pathways to the Science Standards*.)

In the National Science Education Standards for Teaching, section B is especially worth noting for teachers of early childhood. "Teachers of science guide and facilitate learning. In doing this, teachers:

- Focus and support inquiries while interacting with students.
- Orchestrate discourse among students about scientific ideas.
- Challenge students to accept and share responsibility for their own learning.
- Recognize and respond to student diversity and encourage all students to participate fully in science learning."

These principles suggest that student exploration may not be linear. You may begin with a plan—one of the lessons in this unit—and end up following student curiosity in a totally new direction. (Do not be surprised if you set out to make butter and end up watching it melt!) Remember, the goals of this unit are *processes* not facts. While you may use the correct terms (like solid, liquid, gas, properties) in dialogue with students, the terms are not the lesson. They also emphasize the importance of language development in science, and the crucial function of open discourse in inquiry.

While a Student Page is provided for most SCoPE lessons, this is not an endorsement of the use of paper "worksheets" in kindergarten science. Some teachers enjoy the convenience of a paper response form, which can be shared with parents as a way of communicating the ideas that are being shared in class. This helps parents and students find authentic, real-world applications at home. However, many other teachers will use only the charts suggested in most lessons and skip the individual paper.

These lessons also suggest some ongoing graphical formats for discussing ideas, such as floor graphs and Venn diagrams. While these forms may not be easy at first for children, they become more familiar with constant repetition and help students organize their own ideas later in the year.

National Science Resource Council. *National Science Education Standards.* Washington, DC: National Academy of Sciences, 1996.

National Science Teachers Association. *Pathways to the Science Standards: Elementary School Edition.* Arlington, VA: National Science Teachers Association, 2000.